## REMARKS

Claims 1-10 are presently pending and stand finally rejected. Claim 1 has been amended to clarify the subject matter that Applicants regard as their invention. The purpose of this amendment and response is to advance the case to issue or alternatively, to narrow the issues to be presented on appeal.

Claim 1 as indicated above has been amended. In the last amendment, claim 1 was amended to indicate that the heat pipe had a wall structure that allowed the liquid cryogen to wick. In fact, as indicated in Paragraph 20 of the instant application, there are two embodiments of the heat pipe used in connection therewith. Both embodiments utilize a working fluid. In Fig. 3, the heat pipe has an upper exchange surface and as such, the working fluid is not necessarily the same as the cryogen held in the cryogen vessel. In Fig. 4, there is no upper exchange surface and therefore, the working fluid is the cryogen held in the vessel. In any case, claim 1 as amended in the previous amendment would make little sense when taken in connection with claim 10 that includes the upper exchange surface and therefore would use the heat pipe of Fig. 3.

The Examiner rejected claims 1, 2, 7, 9 and 10 under 35 U.S.C. §103(a) as being unpatentable over Sarwinski et al. (Sarwinski) in view of Basiulis or Nelson.

Taking the Examiner point by point, the Examiner states that Sarwinski discloses Applicants basic inventive concept, a superconducting magnet system with a cryocooler 48 which cools a shield 30 using neon substantially as claimed with the exception of using a wicking material in the heat pipe.

This reading by the Examiner of Sarwinski is incorrect in the first instance in that "shield 30" is not a shield, but rather a thermal siphon 30 in which neon gas exits a ballast tank 32 that is in contact with the shield. Liquid neon flows out of the bottom of the ballast tank 32 down a down leg 34 and then up up leg 36 where vapor joins the ballast tank and is condensed to produce the circulation within the up and down legs 34 and 36. The heated neon gas exits the ballast tank 32 through a gas line 38 and is then condensed in a cryocooler 48. The liquid neon

flows back to the ballast tank 32 through a liquid line 40. Liquid line 40 and the gas line 38 are enclosed in an insulated tube 42.

Applicants disagree that Sarwinski shows the invention substantially as claimed. In Applicants' invention as recited in claim 1, the cryocooler is positioned to provide refrigeration to the cryogenic shield and a heat pipe extends from a cryogen vessel to the cryogenic shield, the heat pipe having a wall structure allowing a heat pipe working fluid to wick and thereby to effect heat transfer from the shield to the liquid cryogen. As indicated above, in Sarwinski the cryocooler 48 does not provide refrigeration to the cryogenic shield, rather, it provides refrigeration to the liquid that is contained in the ballast tank. Importantly, Sarwinski does not disclose a heat pipe. While heat pipes are known in the art as disclosed in Basiulis and Nelson, it would not be obvious to one of ordinary skill in the art to modify a cryogenic magnet cooling system of Sarwinski by using a wicking material in the heat pipe. The question would have to be asked as to where such wicking material would be used. For instance, the wicking material would have no place in either of the passages 34 or 36 given that in passage 36, there is only vapor and in passage 34 there is only liquid. Consequently, there would be no advantage in placing a wicking material in either of the passages in that the wicking material would decrease the cross-sectional flow area and actually inhibit liquid or vapor flow.

As mentioned above, while Basiulis and Nelson both disclose heat pipes neither references discloses the use of heat pipes in connection with a cryogen vessel that contains liquid cryogen that is capable of providing cooling independently of the cryocooler of Sarwinski. In this regard, the heat pipes shown in these references are designed to transfer heat from an evaporator section (one end of the heat pipe) to a condenser end (the other end of the heat pipe). Specifically, Basiulis discloses a heat pipe that employs a reservoir 16 to contain the working fluid. Before the device is activated, the working fluid will be in a vapor state. To activate the heat pipe, the condenser section 12 is cooled down to cryogenic temperature to condense the vapor on a wick 30 leaving only superheated gas in the reservoir 16. When the evaporator section 11 is exposed to

heat, the liquid working fluid in that section of the pipe will vaporize and thereby cause a migration of vapor towards the condenser section 12. The removal of heat at condenser region 12 causes the working fluid to condense and through capillary action be transported to evaporator section 11 to take up more heat. There is no discussion of this reference of placing the condenser section 12 in contact with a cryogen vessel containing liquid cryogen or the liquid cryogen itself contained in such a vessel to supply refrigeration. The same holds true for Nelson.

It is thus readily apparent that both the Basiulis and Nelson references disclose heat pipes that are quite distinguishable from the up and down flow tubes of the thermal siphon 30 of Sarwinski and there exists no teachings in the references to add a wicking material to such tubes. As mentioned above, one skilled in the art would not do so in the first instance. It is even unclear how these references would be combined in that the heat pipe would have to wrap around the heat shield 28 with opposite condenser and evaporator ends evidently within the cryogen tank 32. Since both ends would be at the same temperature, given the above discussion, the heat pipe would not be effective to transfer heat to begin with. Consequently, claim 1 is not rendered obvious by such rejecting combination.

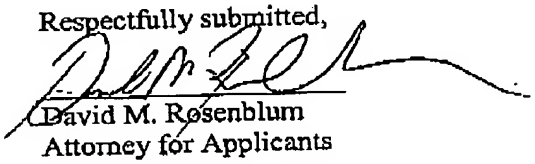
The Examiner also rejected claims 1-10 under 35 U.S.C. §103(a) as being unpatentable over Breneman et al. (Breneman) in view of either Basiulis or Nelson. The Examiner states that Breneman discloses Applicants basic concept, a superconducting magnet system with a cryocooler 42 which cools shields 32 and 34 and a cryogen vessel and a heat pipe 66, 68 to cool the shield. Here, the cryocooler 42 is in fact in contact with the shield as in the Applicants' invention. However, the Examiner is incorrect when he characterizes passages 66 and 68 as a heat pipe. Again, as in Sarwinski, discussed above, and with specific reference to Fig. 4 of Breneman, line 66 is a down leg in the annular tank 52 containing liquid nitrogen 53. Tubing leg 68 is the up leg to the nitrogen to the tank 52 to effect a thermo siphon-type of circulation. For reasons discussed above, skilled in the art would not insert a wicking material to the down leg 66 or the up leg 68 because such wicking material would obstruct the flow within such legs. Simply put,

Breneman has not disclosed a heat pipe any more than Sarwinski. Again, it would not be clear in any event as to how Basiulis or Nelson would have any applicability to Brenemen given the fact that both ends of such heat pipes would be at the same temperature and therefore would not be effective to transfer heat. As such, amended claim 1 is also patentable over such rejecting combination including Breneman.

Since amended claim 1 is patentable and not rendered obvious by the prior art, the remaining dependent claims should be allowable on the same basis. As such, rejection of claims 3-6 and 8 under 35 U.S.C. §103(a) as being unptatentable over Sarwinski in view of Basiulis or Nelson as applied to claims 1, 2, 7, 9 and 10 above and further in view of Lehmann et al. is hereby rendered moot.

In view of the amendment to the claims and the remarks set forth above, Applicants request reconsideration of the rejection and the allowance of all presently pending claims. Since the claims are in condition for allowance, prompt and favorable action is hereby respectfully solicited.

Respectfully submitted,



David M. Rosenblum
Attorney for Applicants
Reg. No. 29,341

Danbury, CT 06810
(203) 837-2116
December 8, 2006

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